REMARKS

Claims 1-35 are pending in the present application.

In the office action mailed January 27, 2003, claim 5 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-3, 10, 20, 21, 25-28, and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,230,039 to Grossman *et al.* ("the Grossman patent"). Claims 4-9, 11-19, 22-24, 29-32, 34, and 35 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Grossman patent in view of what appears to be U.S. Patent No. 6,366,290 to Dye *et al.* ("the Dye patent"). In addressing the Examiner's rejection, it will be assumed that this is the case.

With respect to the Examiner's rejection of claim 5 under 35 U.S.C. 112, second paragraph, claim 5 has been amended to depend from claim 4, thereby overcoming the Examiner's rejection. It will be apparent from the amendments, and the comments below, that the amendment to claim 5 was made independent of the Examiner's rejection of the claim based on the cited references. The previously mentioned amendment does not narrow or further limit the scope of the invention as recited by claim 5. Generally, the amendment makes explicit what is implicit in the claim. Consequently, the amendments should not be construed as being "narrowing amendments," because these amendments were not made for a substantial reason related to patentability.

The disclosed embodiments of the invention will now be discussed in comparison to the prior art. Of course, the discussion of the disclosed embodiments, and the discussion of the differences between the disclosed embodiments and the prior art subject matter, do not define the scope or interpretation of any of the claims. Instead, such discussed differences merely help the Examiner appreciate important claim distinctions discussed thereafter.

Embodiments of the present invention include a method and apparatus for calculating texture coordinates according to various texture addressing modes for texture mapping operations. In one embodiment, an apparatus and method for implementing a "repeat address mode" for texture addressing is provided. The apparatus includes a multiplexer that receives the input texel coordinate, a first calculated value and a second calculated value. One of the three values is selected to be provided as the output texel address. Selection is made based

on the sign of the input texel coordinate, the sign of the first calculated value, and the sign of the second calculated value. The output texel coordinate that is provided by the apparatus will result in an output texel coordinate address that results in a repeat address mode where the input texel coordinate is outside of the coordinate range of the texture map.

A second embodiment of the present invention is directed to calculating an output texel address for implementing a "mirror addressing mode." The embodiment includes a multiplexer that receives the input texel coordinate, a first calculated value and a second calculated value. As with the embodiment directed to the repeat address mode, one of the three values is selected to be provided as the output texel address. Selection is made based on the sign of the input texel coordinate, the sign of the first calculated value, and the sign of the second calculated value. The output texel coordinate that is provided by the apparatus will result in an output texel coordinate that results in a mirror address mode where the input texel coordinate is outside of the coordinate range of the texture map.

Another embodiment of the present invention is directed to calculating an output texel coordinate for implementing a coarse clamping operation. As with the previous embodiments, a multiplexer that receives the input texel coordinate, a first calculated value and a second calculated value is included in the apparatus. One of the three values is selected to be provided as the output texel address based on the sign of the input texel coordinate, the sign of the first calculated value, and the sign of the second calculated value. The output texel coordinate that is provided by the apparatus will result in an output coordinate that results in a coarse clamping operation where the input texel coordinate is outside of the coordinate range of the texture map.

Another embodiment of the present invention is directed to an apparatus and method that implements a repeat address mode, a mirror address mode, and a coarse clamping mode. A multiplexer receives various values including the input texel coordinate, a first calculated value, a second calculated value, and a third calculated value. One of the values is selected as the output texel coordinate based on the sign of the input texel coordinate, the sign of the first calculated value, and the sign of the second calculated value.

The Grossman patent describes a texture mapping circuit that implements a conventional repeat mapping mode, and a "clamping mode" and a "select mode." *See* col. 9, line

60-col. 10, line 27. As described in the Grossman patent, the clamping and select texture modes are implemented in special hardware. The clamping mode allows out of range pixels to be set to a border texture value thereby preventing the repetition of the texture map pattern over the out of range pixels. The select texture mode allows a particular texture coordinate range to be enabled for texturing. That is, coordinates outside of the enabled range are not modified by texture processing. Thus, a particular coordinate range can be targeted for texturing, while texturing of areas outside of the enabled coordinate range is suppressed. *See* col. 10, lines 4-27.

Although the Grossman patent describes a system that is directed to handling input texel coordinates that are outside of a coordinate range of a texture map, which is similar to embodiments of the present invention, the apparatus and method described in the Grossman patent do not anticipate the present invention. Generally, the process described in the Grossman patent is as follows. The input texture coordinate is compared to the range of "enabled" coordinates to determine whether texturing should be applied. *See* col. 10, line 65-col. 11, line 16. If the input texture coordinate is outside of the enabled coordinate range, no texturing is applied. *See* col. 11, lines 16-36. However, if the input texture coordinate is in the enabled coordinate range, it is then determined whether the input texture coordinates are within the range of texture map. *See* col. 11, lines 36-50. If the input texel coordinate is within the range of the texture map, the coordinates are processed normally. *See id.* If, however, the coordinates are outside of the range, a clamping operation is performed. In the case of the input texel coordinate being outside of the range in the negative direction, the output texel coordinate is clamped to the texel coordinate at the "0" edge of the texture map. In the case of the input texel coordinate being outside of the range in the positive direction, the output texel coordinate is clamped to the texel coordinate at the "1" edge of the texture map. The output texel coordinate is then processed for texturing. *See* col. 11, line 52-col. 12, line 12.

As previously mentioned, claims 1-3, 10, 20, 21, 25-28, and 33 have been rejected under 35 U.S.C. 102(b) as being anticipated by the Grossman patent. Claim 1 is patentably distinct from the teachings of the Grossman patent. Claim 1 recites in a graphics processing system, a method for calculating texture coordinates for a texture map having an acceptable range of coordinate values, comprising determining whether an input texture coordinate value is located within one of a plurality of predefined negative or positive input ranges or the acceptable

range of coordinate values, calculating a texture coordinate value for each of the predefined input ranges, and selecting from the calculated texture coordinate values and the input texture coordinate value which one to be provided as a corresponding texture coordinate based on the sign of the input texture coordinate value and of the calculated texture coordinate values.

The Grossman patent fails teach the combination of limitations recited by claim 1. For example, as previously described, although the process described in the Grossman patent uses the sign of the input texel coordinate in determining to which edge of the texture map the output texel coordinate is clamped in the event the input coordinate is outside the coordinate range of the texture map, no other values are calculated for coordinate ranges outside of the texture map, and selection for the output texel coordinate is not based on the sign of the calculated values and the input texel coordinate, as recited in claim 1. In the Grossman patent, once the input texture coordinates are located relative to the coordinate range of the texture map, a clamped value is provided as the output texture coordinate. Additional calculation of values and the process of selecting from the values is not described by the Grossman patent. Moreover, the system described in the Grossman patent describes using conventional repeat mode in addition to the clamping and select modes.

Claims 10 and 21 are also patentably distinct from the Grossman patent. Claim 10 recites a method of calculating a texture coordinate for a texture map from an input texture coordinate value located in one of a plurality of predefined input ranges, comprising calculating a plurality of texture coordinate values corresponding to the plurality of predefined input coordinate ranges in accordance with the sign of the input coordinate value, selecting an output texture coordinate from the plurality of calculated texture coordinate values and the input texture coordinate value based on the sign of the input texture coordinate and the sign of the calculated texture coordinate values.

Claim 21 recites a method for calculating texture coordinates that are within an acceptable range of texture coordinates, comprising determining whether an input texture coordinate is located in the acceptable range of texture coordinates, or in one of a plurality of negative or positive input ranges defined outside of the acceptable range of input values, calculating a coordinate value for each of the negative input ranges or positive input ranges in accordance with the sign of the input texture coordinate, and selecting an output texture

coordinate from the calculated coordinate values and the input texture coordinate in accordance with the sign of the input texture coordinate and the calculated coordinate values and a selected addressing mode.

The Grossman patent fails to described the combination of limitations recited in either claims 10 or 21. For example, as similarly discussed with respect to claim 1, the Grossman patent fails to describe calculating a plurality of texture coordinate values corresponding to a plurality of predefined input coordinate ranges and selecting an output texture coordinate from the plurality of calculated texture coordinate values and the input texture coordinate value based on the sign of the input texture coordinate and the sign of the calculated texture coordinate values.

Claim 26 is also patentably distinct from the Grossman patent. Claim 26 recites a texture addressing circuit for calculating texture coordinates for a texture map having a size and an acceptable range of input coordinate values, the circuit comprising a plurality of coordinate calculation circuits corresponding to a plurality of input coordinate ranges defined outside of the acceptable range for both negative and positive input coordinate values, each coordinate calculation circuit coupled to receive a signal corresponding to the sign of the input coordinate value and a respective texture size value corresponding to a multiple of the size of the texture map, each coordinate calculation circuit providing a respective coordinate output value, a selection circuit coupled to receive as input values the input coordinate and the coordinate output values of the plurality of coordinate calculation circuits, the selection circuit selecting one of the input values as an output texture coordinate value, and select logic coupled to the selection circuit and further coupled to receive input signals corresponding to the sign of the input coordinate value and the signs of the coordinate output values, the select logic providing a selection signal commanding the selection circuit to select one of the input values as the output texture coordinate in accordance with the received input signals.

The Grossman patent fails to describe the combination of limitations recited in claim 26. The Grossman patent, for example, does not describe a plurality of coordinate calculation circuits, a selection circuit, and select logic as recited in claim 26. As previously discussed with respect to claims 1, 10, and 21, the Grossman patent does not calculate other values for coordinate ranges outside of the range of coordinates for the texture map, and select

therefrom an output texel coordinate based on the sign of those values as part of the process for determining the output texel coordinate.

For the foregoing reasons, claims 1, 10, 21, and 26 are patentably distinct from the teachings of the Grossman patent. Therefore, the rejection of claims 1, 10, 21, and 26 under 35 U.S.C. 102(b) should be withdrawn.

Claims 2 and 3, which depend from claim 1, claim 20, which depends from claim 10, claim 25, which depends from claim 21, and claims 27, 28, and 33, which depend from claim 26, are allowable based on their dependency from a respective allowable base claim. That is, each of the dependent claims further narrows the scope of the claim from which it depends, and consequently, if a claim is dependent from an allowable base claim, the dependent claim is also allowable. However, because each claim in an application represents a different invention, the rejection of an independent claim does not necessarily result in the rejection of claims depending therefrom. For the foregoing reasons, the rejection of claims 2, 3, 20, 25, 27, 28, and 33 under 35 U.S.C. 102(b) should be withdrawn.

Claims 4-9, 11-19, 22-24, 29-32, 34, and 35 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Grossman patent and the Dye patent.

The Examiner has referenced the Dye patent as teaching "the specific formula for calculating the texture coordinates and the specific way of selecting the corresponding texture coordinates (see for example columns 25-36)." *See* the Office Action at page 8. However, after review of the materials cited by the Examiner, it is uncertain how the exemplary software listing of Appendix A relates to claims 4-9. The software listing of Appendix A provides instructions to determine the region to which a texel coordinate corresponds, and implementation of the various conventional filtering techniques that can be performed by the invention described in the Dye patent, depending on the region in which the texel coordinate corresponds. For example, the various conventional filtering techniques described in the Bye patent, and in software listing of Appendix A, include point sampling and bilinear filtering, both four-texel averaging and two-texel averaging. It is difficult to understand the relationship between the "specific formulas" described in Appendix A and the limitations recited by claims 4-9. Combining the various conventional filtering techniques described in the Dye patent with the teachings of the Grossman patent fail to teach or suggest the limitations recited by claims 4-9. The teachings of the Dye

patent do not make up for the deficiencies in the teachings of the Grossman patent, as previously discussed with respect to claims 1, 10, 21, and 26. Moreover, claims 4-9, 11-19, 22-24, 29-32, 34, and 35 are allowable based on their dependency from a respective allowable base claim, namely, claims 1, 10, 21, or 26.

For the foregoing reasons, claims 4-9, 11-19, 22-24, 29-32, 34, and 35 are patentable over the teachings of the Grossman patent in view of the Dye patent. Therefore, the rejection of claims 4-9, 11-19, 22-24, 29-32, 34, and 35 under 35 U.S.C. 103(a) should be withdrawn.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with Markings to Show Changes Made**".

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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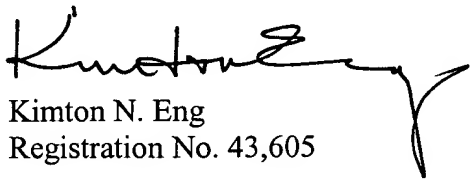

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claim 2 has been cancelled.

Claims 1 and 5 have been amended as follows:

1. (Once amended) In a graphics processing system, a method for calculating texture coordinates for a texture map having an acceptable range of coordinate values, comprising:

determining whether [remapping] an input texture coordinate value is located within one of a plurality of predefined negative or positive input ranges or [outside] the acceptable range of coordinate values;

calculating a texture coordinate value for each of the predefined input ranges; and

selecting from the calculated texture coordinate values and the input texture coordinate value which one to be provided as [to] a corresponding texture coordinate [located within the acceptable range of coordinate values] based on the sign of the input texture coordinate value and [location of the input texture coordinate value relative to the acceptable range] of the calculated texture coordinate values.

5. (Once amended) The method of claim 4 [2] wherein selecting the corresponding texture coordinate comprises:

where the sign of the input texture coordinate value is negative, selecting B when ($A < 0$), otherwise selecting A as the corresponding texture coordinate; and

where the input texture coordinate value is equal to zero or the sign of the input texture coordinate is positive, selecting the input texture coordinate value when ($A < 0$), selecting A when ($B < 0$), and selecting B otherwise.